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Electroretinography and histology results of a photovoltaic sub-retinal prosthesis implanted in porcine for two years

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Purpose: To investigate electroretinography (ERG) and histology of eyes of porcines implanted with a photovoltaic sub-retinal prosthesis for two years.

Methods: A photovoltaic sub-retinal prosthesis was implanted to porcine. The prosthesis is an 8x8 pixel array, each pixel constructed by parallel micro-photodiodes, equipped with an independent output electrode and a locally surrounding return electrode. The chip is powered by on-chip solar cells and embedded with a unique division-power-supply-scheme (DPSS) circuit. The implantation method is through choroid. ERG was performed with different protocols (Roland, Germany). Subsequently, the porcine was sacrificed and the eyeballs were prepared for histological examination.

Results: The prosthesis had been implanted for 2 years. The chip was located well in the posterior fundus sub-retinally. No retinal detachment was noted. Fundus image showed no significant fibrosis. ERG showed significant b-wave responses after bleaching in the implanted eye, whereas the control eye showed flat response. Histology of the retina overriding the chip reviewed degenerated outer layer of retina and relatively preserved inner retina.

Conclusions: The electrophysiology and biocompatibility of a photovoltaic subretinal prosthesis with DPSS are verified *in vivo*.

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